CLAIMS:

Claim 1. A sensing system for detecting cracks and structural integrity of material, comprising:

a material under test;

an insulating substrate mounted on said material;

a test pattern deposited on said insulating substrate, forming an element of an oscillator for a transmitter to radiate a radio frequency RF signal; and

a remote sensing circuit to detect any deviation of the received signal from said transmitter as a measure of the presence of any crack in the material under test.

Claim 2. The sensing system as described in claim 1, wherein said remote sensing circuit is inductively coupled to a LC tank circuit of said transmitter.

Claim 3. The sensing system as described in claim 1, wherein said test pattern is an inductor and any breakage of the inductor due to propagation of a crack in the underlying material under test frequency- modulates the oscillator. .

Claim 4. The sensing system as described in claim 3, wherein said inductor is a spiral coil.

Claim 5. The sensing system as described in claim 3, wherein said inductor forms a LC tank circuit in the transmitter and any breakage of the inductor causes the resonant frequency of the oscillator to shift.

Claim 6. The sensing system as described in claim 5, wherein said remote sensing circuit is a phase/frequency detector to detect the phase/frequency deviation of the received signal.

Claim 7. The sensing system as described in claim 1, wherein said test pattern is a bank of resistors and any breakage of said resistors due to propagation of a crack in the underlying material under test amplitude-modulates the oscillator.

Claim 8. The sensing system as described in claim 7, wherein the resistors are used to determine the quality factor Q of a LC tank circuit

Claim 9. The sensing system as described in claim 8, wherein the signal strength of the transmitter depends on the integrity of the resistors.

Claim 10. The sensing system as described in claim 9, wherein said remote sensing circuit is a detector, which can demodulate both FM signal and AM signal.

Claim 11. The sensing system as described in claim 6, wherein the said radiated signal from said transmitter is picked up by a parallel LC tank circuit to develop an RF voltage.

Claim 12. The sensing system as described in claim 11, wherein said RF voltage is detected by a detector comprising:

a bridge circuit to output said RF voltage;

an amplifier to amplify said RF voltage;

a voltage controlled oscillator (VCO) which is controlled by a voltage ramp to generate a sweep frequency;

a multiplier to multiply the said RF voltage with the sweep frequency signal from said VCO and to yield a DC and double frequency output when the sweep frequency coincides with said RF signal;

a DC voltmeter to measure the any AM signal from said transmitter to indicate any amplitude deviation, hence the presence of the crack, when the resistance bank is used as the test pattern; and

a frequency counter to count the double frequency of an FM signal to measure the frequency deviation and hence the presence of the crack when an inductor is used as the test pattern..

Claim 13. A method of sensing a crack of material, comprising the steps of:

depositing an insulating layer on a material to be tested;

depositing a test pattern of an electronic element on said insulating layer as a component of an oscillator;

modulating the oscillator with deviations of said electronic element value due to a crack in said material propagating to said test pattern;

remote sensing an RF signal from said oscillator; and

demodulating said RF signal to measure the presence of any said crack.

Claim 14. The method as described in claim 13, wherein said test pattern is an inductor used in the LC tank circuit of the oscillator, and the oscillator is frequency modulated by said crack.

Claim 15. The method as described in claim 13, wherein said test pattern is a resistance bank, which controls the quality factor Q of LC tank circuit of said oscillator, and the oscillator is amplitude modulated by said crack.